

II. The SOLENOCONCHIA, comprising the Genera *Dentalium*, *Siphodentalium*, and *Cadulus*. By the Rev. R. BOOG WATSON, B.A., F.L.S., &c.

[Read November 21, 1878.]

THE subjoined list is an enumeration of the species of *Dentalium* referred to in detail.

DENTALIUM.

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| 1. <i>D. capillosum</i> , Jeffr. | 10. <i>D. longitrorsum</i> , Reeve. |
| 2. <i>D. ageum</i> , W. | 11. <i>D. compressum</i> , W. |
| 3. <i>D. amphialum</i> , W. | 12. <i>D. subterfissum</i> , Jeffr. |
| 4. <i>D. ceras</i> , W. | 13. <i>D. didymum</i> , W. |
| 5. <i>D. diarrhox</i> , W. | 14. <i>D. yokohamense</i> , W. |
| 6. <i>D. entalis</i> , W. | 15. <i>D. dentalis</i> , Linn. |
| 7. <i>D. leptosceles</i> , W. | 16. <i>D. javanum</i> , Sow. |
| 8. <i>D. circumcinctum</i> , W. | 17. <i>D. ensiculus</i> , Jeffr. |
| 9. <i>D. acutissimum</i> , W. | 18. <i>D. tornatum</i> , W. |

1. DENTALIUM CAPILLOSUM, Jeffr.; Jeffreys, 'Valorous' Report, Proc. Roy. Soc. xxv. No. 173, 1876, p. 191. No. in list 26. Do. Ann. & Mag. Nat. Hist. 1877, xix. p. 153.

St. II. Jan. 13, 1873. Lat. 38° 10' N., long. 9° 14' W. Setubal. 470 fms. *Globigerina*-ooze. 1 specimen.

(?) St. 24. Mar. 25, 1873. Off Culebra Is., St. Thomas, D. W. I. 390 fms. Mud.

St. 73. June 30, 1873. Lat. 38° 30' N., long. 31° 14' W. 1000 fms. *Globigerina*-ooze. W. of Azores. 2 specimens.

St. 78. July 10, 1873. Lat. 37° 24' N., long. 25° 13' W. 1000 fms. *Globigerina*-ooze. Off San Miguel, Azores. 1 specimen, young, and 2 fragments.

Mr. Gwyn Jeffreys gives this species as taken by the 'Valorous' at St. 12, 1450 fms.; St. 13, 690 fms.; St. 16, 1785 fms.; by the 'Porcupine,' 1869, Bay of Biscay, 862 fms., N. of Hebrides, 542 fms.; and he states that Pourtales got it in the Bay of Mexico, off Bahia Honda, in 418 fms. He has described the ribs as "sharp (not rounded)." They rather seem to be sharply cut; but they are rounded on the top. L. 2.1 in. B. at mouth 0.22, at apex 0.036.

The young specimen from St. 78 has at the apex on the convex

curve a slit 0·1 in. long, but interrupted by two bridges of the shell which have not been removed when the fissure was made.

From St. 73 and St. 78 the specimens belong to the typical form; that from St. II., a remarkably large and fine specimen, belongs to a variety, *D. capillosum*, var. *paucicostatum*, W., with only about 40 instead of 65 longitudinal riblets or threads, which are very flat on their top, and are divided by furrows remarkably broad and square in form. These differences strike one very strongly at first; but the transverse sculpture is identical, and there are spots on the typical specimens which present an exactly similar form of ribbing.

From St. 24 the specimen is only a fragment, and that of a young shell of very difficult determination. Count Pourtales, however, having already found this specimen in the Gulf of Mexico, his authority relieves me from the responsibility of giving the West Atlantic as a locality for the species; so I content myself with adding a mark of interrogation to the 'Challenger' specimen.

2. DENTALIUM ÆGEUM, W. (*αἴγιος*.)

St. 149 (8). Jan. 29, 1874. Off London River, Kerguelen Islands. 110 fms. Mud. 1 specimen.

Shell.—Long, conical, finely tapering, much and very equally bent, though less, of course, as the shell grows larger, thin, pure white, porcellanous, a little chalky towards the mouth, but higher up brilliant. *Sculpture*. Longitudinal ridges 30 to 35, unequal, rounded, above close, rather high, narrow, and parted by furrows which equal the ribs, but lower down these ribs become broader and flatter and the furrows widen, till towards the mouth the surface becomes uniform, and the ridges are only indicated by the faint striæ of the furrows. Under a lens the whole surface shows a faint longitudinally striated texture. On the upper part of the shell the striæ of growth are very faint; but they become rather strongly marked towards the mouth. Towards the apex the outer layers for half an inch are stripped off, and leave exposed the brilliant smooth core, presenting many longitudinal facets corresponding with the ridges of the outer layer. There is an irregular short fissure with broken edges at the apex on the convex curve. L. 2·5 in. B. at mouth 0·3, at apex 0·033.

Than *D. capillosum*, Jeffr., this is more conical, more curved, the

ridges are fewer, and the furrows between much wider and more open.

3. *DENTALIUM AMPHIALUM*, *W.* (*ἀμφιάλος*.)

St. 323. Feb. 28, 1876. Lat. $35^{\circ} 39'$ S., long. $50^{\circ} 47'$ W. Off the mouth of La Plata. 1900 fms. Grey mud. 2 specimens.

Animal.—Small for the shell, of a pale ruddy colour, which is deeper and browner on the foot and liver, the latter very large: two large masses of long, fine, equal captacula fill the mantle-cavity; they spring from the front of the pedestal out of which the buccal mass and the foot rise; and of these, two large bunches project through the mantle-orifice: buccal tentacles very small.

Shell.—Long, conical, nearly straight, what curve there is very equal throughout, of a dirty brownish yellow, chalky on the surface, porcellanous beneath. Both specimens are very much eroded, especially on the convex curve, and show a prodigious number of layers of shell, which is, however, thin and slight. There is a short, irregular anal fissure on the convex curve.

Sculpture. There are about 50 very slightly raised, rounded, longitudinal ridges, the furrows between which are very much like the ridges reversed, being very shallow and open. These vary a good deal at different parts of the shell, and tend to disappear towards the mouth; they are crossed by fine, close-set, sharp, but very superficial, irregular scratches, which run elliptically round the shell, advancing on the concave and retreating on the convex curve. As the shell grows, these lines of growth become harsh and broken. L. 2, nearly. B. 0·3, nearly; least B. 0·05.

This species is somewhat like the *D. zelandicum*, Sow. "jun., N. Zealand," B.M., but in form is much stumpier, the ridges are closer, and the shell thinner. Than *D. grande*, Desh., "Japan," B.M., it likewise is stumpier in form, the ridges are less strong, the furrows less marked, the circular striæ less sharp: in *D. amphialum* the longitudinal ridges die out, while in *D. grande* they continue equally strong.

4. *DENTALIUM CERAS*, *W.* (*κέρας*.)

St. 246. July 2, 1875. Lat. $36^{\circ} 10'$ N., long. $178^{\circ} 0'$ E. Mid Pacific, E. of Japan. 2050 fms. Grey ooze. 3 specimens.

St. 299. Dec. 14, 1876. Lat. $33^{\circ} 31'$ S., long. $74^{\circ} 43'$ W. W. of Valparaiso. 2160 fms. Grey mud. 1 specimen.

Animal.—Mantle is white, very thin, and transparent; the adductor muscles are short and weak. The liver is small, of a light greyish brown. The mouth of the mantle is very strong, of a yellowish colour, and the animal is rather fawn-coloured.

Shell.—Like one of the old drinking-horns, short, stumpy, and a good deal bent, rather thin; the newer growth porcellanous, the older chalky, and given to break off in flakes, leaving a perfectly smooth brilliant porcellanous core. *Sculpture*. The surface is covered with close-set annular striæ, which, especially on the longitudinal ribs, show like minute, crisp, round threads. The longitudinal ribs are very much stronger, but still are fine, rounded, parted by rounded furrows much like the ribs; both, but especially the furrows, are irregular in size, fresh riblets arising in the hollows. There are from 30 to 35 toward the apex, and from 70 to 80 toward the mouth. *Colour* pure white. *Edge* thin and broken at the mouth; at the apex there is an irregular ragged fissure in the convex curve. L. 1·8 in. B. at mouth 0·3, at apex 0·07.

One specimen from St. 246 is much less curved than the others. That from St. 299 (distant 4500 m. N. and S., and 6000 m. E. and W.) is much broader (L. 1·7, B. 0·36) and much more bent, but is obviously identical.

This, compared with *D. amphialum*, W., is more curved; the longitudinal striæ are much narrower, more distinct, and more persistent. Than *D. grande*, Desh., this is a much smaller and especially shorter and stumpier form, without the regular circular liræ, and the longitudinal ribs are much weaker and are closer set. Compared with *D. capillosum*, Jeffr., which it superficially resembles, it differs in texture, form, and sculpture.

5. DENTALIUM DIARRHOX, W. (διάρρῶξ.)

St. 169. July 10, 1874. Lat. 37° 34' S., long. 179° 22' E. N.E. from New Zealand. 700 fms. Grey ooze. 4 specimens.

Animal.—Mantle white, body pale yellow. Captacula many, fine, long and equal, with small ovoid points. Foot and collar those of a true *Dentalium*.

Shell.—White (chalky), but porcellanous beneath the surface; rather straight, with a considerable bend near the apex, of rather rapid expansion from a very fine apex. *Sculpture*. The whole surface is faintly marked with scarcely impressed longitudinal lines of very equal interval (about 0·0055 apart); transversely

it is very faintly scratched all over by very slight lines which run elliptically round the shell. The apex has a very narrow, slightly ragged fissure, about 0.027 in. long, which lies unsymmetrically on the convex curve. L. ? B. 0.9.

This differs from *D. leptosceles*, W., in being more curved and more conical. It resembles in form the young of *D. lubricatum*, G. B. Sow., B. M., "from Australia;" but in that the transverse striæ are much less oblique, and the surface is lubricate and polished.

6. DENTALIUM ENTALIS, Linn., var. *D. STRIOLATUM*, Stimpson; *Linn. Syst. Nat.* p. 1263; *Stimpson, Shells of New England*, 1851.

St. 49. May 20, 1873. Lat. 43° 3' N., long. 63° 39' W. Off Halifax, N. A. 83 fms. Gravel, stones.

One specimen, which, like *D. abyssorum*, Sars, is a little less attenuated than the *D. striolatum*, Stimp. Compared with the following this is rather short, bent, and faintly striate.

(2) Var. AGILE, Sars, *Rem. Forms &c. Norw. &c.* 1872, p. 31, pl. iii. figs. 4-15, = *D. incertum*, Phil. (*nec Desh.*), = *D. fusticulus*, Brug.

St. VIII. Feb. 12, 1873. Gomera, Canaries. 620 fms. Sandy mud and shells. 4 specimens.

In the animal of these specimens the tentacles are many, short, small, and equal. The two lobes of the liver are equal; the anal spatula is rather longer than usual. This variety is long; straight, and smooth. The Marquis de Monterosato (*Nuov. Revista*, 1875, p. 20) gives it as living in the Mediterranean, and as found fossil in the post-Pliocene beds of Italy (*Cat. Conch. Fos.* 1877, p. 8) (see also *Phil. Enum.* ii. 207). Sars, too, gives it as living in the North Atlantic and found in the Norwegian post-Pliocene beds.

(3) Var. ORTHRUM, W.

St. II. Jan. 13, 1873. Lat. 38° 10' N., long. 9° 14' W. Setubal. 470 fms. *Globigerina*-ooze. 2 specimens.

St. 75. July 2, 1873. Lat. 38° 37' N., long. 28° 30' W. Fayal, Azores. 450 fms. Sand. 1 specimen.

St. 145. Dec. 27, 1873. Lat. 46° 40' S., long. 37° 50' E. Prince Edward's Island. 150 fms. 1 specimen.

This variety is rather long, straight, and sharply striate toward the apex.

The localities for this variety are very remarkable ; but I believe the specimens are really one species, and cannot be separated from *D. entalis*, L.

The geographical distribution is doubly interesting in connexion with its extreme antiquity, which Mr. Gwyn Jeffreys (B. C. iii. 192), on the authority of Hörnes (Foss. Moll. Tert. Beck. Wien, 1856), carries back even to the Miocene.

7. *DENTALIUM LEPTOSCELES*, *W.* (λεπτοσκελής.)

St. 160. Mar. 13, 1874. Lat. 42° 42' S., long. 134° 10' E. S. of Australia. 2600 fms. Red clay. 3 specimens.

Animal.—Yellow, with a large dark patch in the region of the liver. A close little bunch of captacula round the mantle-opening.

Shell.—Very attenuated, thin, brilliant, porcellanous, with longitudinal flecks of opaque white on the translucency of the shell, chiefly toward the apex where the shell thickens, very little bent, very slightly compressed between the convex and concave curves. *Sculpture*. There is some kind of flexuous longitudinal texture in the structure of the shell affecting the reflection from the brilliant surface, which is also closely and regularly scratched transversely by very minute, sharp, but superficial lines, which run round the shell a little elliptically. L. 1·5. B. 0·12, at apex 0·04.

This species in form very much resembles *D. erectum*, G. B. Sow., B. M., "from Sydney," for while some specimens of that species are more curved than this, others are even less so; but in this species the transverse striæ are very much more oblique; and in the former there is no trace of the irregular intratextural longitudinal striæ which exist here. Than *D. agile*, Sars, this is a straighter and much more cylindrical, attenuated, brilliant, and delicate shell.

8. *DENTALIUM CIRCUMCINCTUM*, *W.*

St. II. Jan. 13, 1873. Lat. 38° 10' N., long. 9° 14' W. Setubal. 470 fms. *Globigerina*-ooze. 2 young specimens.

St. 23. Mar. 15, 1873. Sombrero Island, St. Thomas, D. W. I. 450 fms. *Globigerina*-ooze. 2 fragments.

St. 122. Sept. 10, 1873. Lat. 9° 5' to 10' S., long. 34° 49' to 53' W. Pernambuco. 350 fms. Mud. 2 fine specimens.

Shell.—Very long and narrow, very slightly bent, and that almost entirely above; a very little flattened on the concave curve so as to be slightly trigonal; white, opaquely porcellanous, a little glossy, not thick but strong. *Sculpture*. Closely and regularly girt round elliptically with scratch-like puckerings in the lines of growth, of which there are about 55 in the $\frac{1}{10}$ of an inch. Longitudinally striped with fine ribs, of which there are from 17 to 20, sharp and well defined by still broader furrows toward the apex, but down the shell these increase in number and steadily decrease in definiteness till they only show as a feeble system of lines on the rounded surface. At the apex there is on the convex curve a ragged irregular fissure about 0.1 in. long. L. 1.93. B. at mouth 0.13, at apex 0.02.

As compared with *D. semipolatum*, Sow., this is a longer, straighter, more attenuated shell, with striæ stronger, blunter, and more persistent. It is not unlike *D. antillarum*, D'Orb., in texture and in size, but is much straighter and narrower, and the early ribs are much finer and fewer. It is intermediate in form between *D. erectum*, G. B. Sow., and *D. splendidum*, Desh., a little stumpier and more curved than the first and less so than the second; it is much more longitudinally ribbed and less polished than either. Than *D. Lessoni*, Desh., it is much more attenuated and never so strongly ribbed longitudinally. Than *D. inversum*, Desh., it is more strongly and persistently striate longitudinally.

The young shell is perplexingly like that of *D. entalis*, var. *orthrum*, W., but is a little straighter, broadens more slowly, and the ribs project more sharply. In maturer specimens this species is obviously much more attenuated than the former.

9. DENTALIUM ACUTISSIMUM, W.

St. 218. Mar. 1, 1875. Lat. 2° 33' S., long. 144° 4' E. N. of Papua. 1070 fms. *Globigerina*-ooze. 2 specimens.

St. 246. July 2, 1875. Lat. 36° 10' N., long 178° 0' E. Mid Pacific, E. of Japan. 2050 fms. Grey ooze. 1 specimen.

Shell.—Long and very attenuated, rather straight, the curve very regular, very thin, brilliant, and glassy. *Sculpture*. The surface is crossed by very fine sharpish irregular striæ, which run very elliptically round. In the young shell the surface is very regularly and finely scratched by a great number of close-

set, regular, sharp, and very minute lines, which very gradually become more and more faint, but are still traceable even in the full-grown shell. The *colour* is pure white, transparent, and almost hyaline in the fresh shell, but in the dead shell the interior (not, as usual, the exterior) layers of the shell become opaque and chalky. The *edge* is very thin and irregularly broken. At the *apex* the end is abruptly broken off in one specimen, in the other there is an irregular fissure with an internal lining process. In the specimen from St. 246, which is full-grown but very short, a large, thin, irregularly shaped process projects, which, being obliquely cut off somewhat across the shell, supplies the anal orifice. L. 1·52, of young specimens from St. 218; B. at mouth 0·12, at apex 0·026. L. 1·14, of old and broken specimen, St. 246; B. at mouth 0·23, at apex 0·14.

Compared with *D. leptosceles*, W., this is more curved, more conical, and thus not nearly so attenuated. Compared with *D. agile*, Sars, also, this is more curved, rather more conical, and very much more delicate. It is likewise, when full-grown, apparently larger than either. Than *D. lubricatum*, G. B. Sow., this broadens more rapidly, is more brilliant, the circular striæ are stronger, the longitudinal are finer, closer, and sharper. It is also straighter than that species. Than *D. pretiosum*, Nuttall, this broadens faster and is much more brilliant.

In reference to the form of the apex, it may be observed that the separation of the *Dentalia* by the absence (*Dentalium*) or presence (*Entalis*) of the cleft process cannot be maintained. In *D. abyssorum*, Sars, there are some with a fissured process, some with a fissure without any process, some with neither fissure nor process. There are cases in which the fissure is very regularly formed, in others it looks as if it had been gnawed, in others it resembles a break; sometimes it is on the convex curve, as is the general case, sometimes on the concave, as in *D. inversum*, Desh., and in *D. subterfissum*, Jeffr.; sometimes it is irregularly lateral, as occasionally in *D. agile*, Sars.

10. DENTALIUM LONGITRORSUM, *Reeve*; *Reeve, Conch. Syst.*; *C. I.* pl. ii. 9.

St. 189. Sept. 11, 1874. Lat. 9° 36' S., long. 137° 50' E. W. of C. York, S.W. of Papua. 28 fms. Mud. 1 specimen.

In the B.M. this is given as from "Zanzibar and China." In Reeve's C. I. this species is given as = *D. politum*, Desh. (*nec* L.), and = *D. Lamarckii*, Chemn.

11. DENTALIUM COMPRESSUM, *W.*

St. 24. Mar. 25, 1873. N. of Culebra Island, St. Thomas, Danish West Indies. 390 fms. Mud. 1 specimen.

Shell.—Compressed between its concave and convex curves to the extent of 0·016 in.; bent, as in young shells, a little more towards the apex, and the curve greater on the convex slope, slightly carinated on each side. *Sculpture*. Faint, but very regular, longitudinal striæ, about 0·01 in. apart, apparently in the texture of the shell, which thus seems to be built up of minute, square-faced rods laid side by side. Crossing these at right angles are sharp, irregular scratches in the line of growth, nearly circular, but bent a little forwards on the concave curve. L. 0·45. B. at mouth 0·05 (least), 0·06 (greatest), apex 0·019.

It is very possible that this may be a *Siphodentalium*, as Mr. Gwyn Jeffreys suggested; but in the absence of the animal and the rubbed condition of both ends of the shell it is impossible to say. It resembles *S. tetragonum*, Brocchi, more than any other; but the want of the angles, the different character of the longitudinal striæ, and, above all, the compression, separate it completely. There is only the one dead discoloured and somewhat rubbed specimen.

12. DENTALIUM SUBTERFISSUM, *Jeffr.*; *J. Gwyn Jeffreys, Ann. & Mag. Nat. Hist.* 1877, xix. 154.

St. 78. July 10, 1873. Lat. 37° 24' N., long. 25° 13' W. Azores. 1000 fms. *Globigerina*-ooze. 10 specimens or fragments.

St. 85. July 19, 1873. Lat. 28° 42' N., long. 18° 6' W. Palma, Canaries. 1125 fms. Volcanic sand. 1 fragment.

St. 120. Sept. 9, 1873. Lat. 8° 37' S., long. 34° 28' W. Pernambuco, S. America. 675 fms. Mud. 2 fragments.

A species peculiar as having the apical slit on the concave curve. The animal is unknown.

Mr. Gwyn Jeffreys got it in the 'Porcupine,' 1869, off the W. coast of Ireland, in 1180–1476 fathoms, and in the 'Valorous' at St. 12, in 1450 fathoms.

13. *DENTALIUM DIDYMU*M, *W.* (*διδυμος*, as *two-sided*. Also from St. Thomas, also as doubtful.)

St. 24. St. Thomas, N. of Culebra Island, Danish W. Indies. 390 fms. Mud.

Shell.—Extremely attenuated, very slightly curved, a little flattened laterally, and that chiefly toward the convex curve, so that the form is slightly trigonal, porcellanous, pure white, brilliant. *Sculpture*. Very fine, irregular scratches run round the shell, the surface of which is not perfectly uniform; there are very faint indications of longitudinal texture, and there is in the substance of the shell a certain transverse flocculence. Towards the mouth the shell is extremely thin as usual; but towards the apex it becomes thick from the smallness of the bore, which lies not in the centre but nearer the convex curve of the shell. L. 1·08. B. 0·06, at apex 0·04.

This measure is taken from the largest of six fragments, none of which preserve the apex of the shell.

14. *DENTALIUM YOKOHAMENSE*, *W.*

St. 233. May 17-26, 1875. Yokohama, Japan. 8-14 fms. Mud.

Shell.—Much curved when young, becoming nearly straight with later growth, little conical, rather strong, opaque, yellowish white, quite dull, but not chalky. *Sculpture*. Irregular, slightly elliptical, lines of growth, a little puckered, generally slight, but sometimes sharp and even; towards the mouth faintly imbricated; occasionally marked by a deep furrow-like constriction of the shell. The *longitudinal ribs* are 8 to 9 in number, equal, rounded, rather strong, but not very prominent. These are parted by furrows, round and open, very shallow, and of very unequal breadth. In these furrows, one, two, or even three thread-like riblets appear, and in the whole texture the lens shows a tendency to a longitudinal rod-like structure. At the apex the shell is squarely truncate, and in the young shell there is, on the convex slope, a slight ragged fissure. L. 1·2. B. at mouth 0·15, at apex 0·003.

The ribs here are much less sharp than they are in *D. dentalis*, L., and there is no trace of the exquisite longitudinal fretted striæ which cover the furrows in that species. The sharp intercostal striæ of *D. octogonum* are quite absent here, and in that species, which is much more bent, the ribs are much wider apart and more equally parted.

15. *DENTALIUM DENTALIS*, *Linn.*; *Linn. Syst. Nat.* 1263; *Born, Mus.* 432, xviii. 13. Living in the Mediterranean, the S.W. of France, and the Canaries.

St. 75 (?). July 2, 1873. Fayal, Azores. 50 to 90 fms.

Dec. 1873. Simon's Bay, Cape of Good Hope. Sand and shells, 15 to 20 fms. Two fragments, one of them, however, consists of the apex and apical process.

Mr. Gwyn Jeffreys was good enough to identify these specimens for me, their state and the newness of the locality making confirmation specially desirable.

16. *DENTALIUM JAVANUM*, *Sow.*; *Sow. Thes. Conch. Dent.* sp. 39, f. 12; *Reeve, C. I.* pl. iii. sp. 14.

Sept. 7, 1874. Torres Strait, C. York. 3-11 fms. 2 young specimens.

St. 186. Sept. 8, 1874. Lat. 10° 30' S., long. 142° 18' E. Wednesday Island, Cape York. 8 fms. Coral sand.

St. 188. Sept. 10, 1874. Lat. 9° 59' S., long. 139° 42' E. W. of C. York, Australia, off the S.W. point of Papua. 28 fms. Mud. 2 specimens.

This species is given in B.M. as from Malacca. *D. octogonum*, L. (which this much resembles), has much stronger intracostal striæ, and the ribs are much more sharply prominent.

17. *DENTALIUM ENSICULUS*, *Jeffr.*; *J. Gwyn Jeffreys, Val. Exp., Ann. & Mag. Nat. Hist.* 1877, xix. 154.

St. 23. Mar. 15, 1873. Off Sombrero Island, St. Thomas, D.W.I. 450 fms. *Globigerina*-ooze. 9 specimens or fragments.

Mr. Gwyn Jeffreys got this species from St. 12, 1450 fms.; St. 16, 1785 fms.; West of Ireland, 1366 fms.; Bay of Biscay, 862 fms.; Portugal, 740-1095 fms.

The bore of the shell lies quite on the convex side, and toward the apex is small.

18. *DENTALIUM TORNATUM*, *W.* (Turned as in a lathe.)

St. 173-4. July 29, 1874. Levuka, Fiji. 12 fms. 6 specimens.

Shell.—Small, narrow, very finely tapering, slightly but very equably bent, strong, of a quill-like translucency and brilliance.

Sculpture. The upper part of the shell is encircled by deep,

close-set, slightly oblique grooves, which look as if they were turned in a lathe. Further down the shell they become shallower, and cease at last rather abruptly. The flat bands of the shell-surface which part them are of variable width, and increase with the growth of the shell from about 0·011 to twice that amount. The front part of the shell is closely, minutely, obliquely striated in the line of growth, with here and there a very faint depression, just suggestive of the grooves above. There is besides these a faint transverse flocculence in the substance of the shell. *Mouth-edge* thin, not contracted, very slightly oblique. The *apex* is abruptly broken across, and there the edge of the shell is thick, and from the opening there projects a minute round pipe about 0·008 broad, and 0·012 long, slightly striated obliquely, abruptly broken off at the end. In most of the specimens only the mere stump of this delicate tube remains. L. 0·55. B. 0·038, apex 0·018.

This species seems to vary a little in breadth.

SIPHODONTALIUM.

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| 1. <i>S. platamodes</i> , W. | 5. <i>S. dichelum</i> , W. |
| 2. <i>S. tythum</i> , W. | 6. <i>S. prionotum</i> , W. |
| 3. <i>S. pusillum</i> , W. | 7. <i>S. eboracense</i> , W. |
| 4. <i>S. tetraschistum</i> , W. | |

1. SIPHODONTALIUM PLATAMODES, W. (*πλαταμώδης*, as flat on the sides.)

St. 24. St. Thomas, N. of Culebra Island, Danish West Indies. 390 fms. Mud. 4 specimens.

Shell.—Small, solid, finely tapered, curved, especially toward the apex, five-sided, with four sharp corners, which are nearly right angles, and one very obtuse angle along the concave curve; these all tend to disappear toward the apex, the young shell being rounded. *Sculpture*. The angles of the shell project more or less in a sharp rounded rib, which is sometimes double; there are a few longitudinal striæ, regular, 0·01 in. apart, strongest near the angles, more or less obsolete as they recede from these. Neither end is fresh enough for description. L. 0·47. B. 0·049.

I have hesitated a good deal in separating this from *S. tetragonum*, Broc., = *quinquangulare*, E. For., with which it agrees more

closely than with the *S. pentagonum*, Sars. Here, however, the longitudinal ribs are much closer, as well as much more obsolete; the shell is more curved throughout its whole length, is more attenuated, and retains its square form and sharp angles instead of becoming rounded as in *S. tetragonum*, Brocchi. Amidst all the variations of that very variable form I have not seen any that connects it with this species.

2. SIPHODONTALIUM TYTTHUM, *W.* (*τυτθός.*)

St. 24. March 25, 1873. Culebra Island, St. Thomas, D. W. I. 390 fms. Mud. 4 specimens.

Shell.—Minute, very conical, *i. e.* broadening rapidly, much bent, very thin, but not hyaline, apparently horny when living, and becoming opaque when dead, and then also glossy but not brilliant. *Sculpture.* Some very faint traces of circular striæ on the lines of growth. *Mouth-edge* very thin and chipped. *Apex* broken, but in one specimen showing the two lateral clefts common in the genus. L. 0·22. B. at mouth 0·049, at apex 0·013.

In texture and in general form this is like *S. vitreum*, Sars, but it broadens much faster and is more curved.

3. SIPHODONTALIUM PUSILLUM, *W.* (*pusillus.*)

St. 85. July 19, 1873. Lat. 28° 42' N., long. 18° 6' W. Palma, Canaries. 1125 fms. Volcanic sand. 2 specimens.

Shell.—Minute, attenuated, slightly bent, thin, transparent, irregularly banded with opaque white, which runs elliptically round the shell. *Sculpture.* There is no trace of longitudinal striæ, but the whole surface is sharply scratched with minute transverse striæ, which run (as usual) not directly round the shell, but advance on the concave and retreat on the convex curve. L. 0·12. B. at small end 0·01, at broad end 0·02.

These specimens are both young, and both ends are chipped.

It is straighter and more tumid than *Siphodentalium minutum*, H. Ad. (Gulf of Suez, *MacAndrew*), and not contracted at the mouth. It is also straighter and more tumid than *D. filum*, Sow. (in part), = *gracile*, Jeffr., Journ. de Conch. 1872, p. 140, v. 5, but more curved and broader than the young of *D. capillosum*, Jeffr. It is much larger, more tumid, and straighter for the same length than *Siphodentalium lofotense*, Sars.

4. SIPHODONTALIUM TETRASCHISTUM, *W.*

St. 113 A. Sept. 2, 1873. Anchorage off Fernando Noronha.
7-25 fms. 1 specimen.

Shell.—Cylindrical, tapering, bent and attenuated from about the middle to the apex; toward the mouth very slightly contracted. It is rather strong, and has the dull gloss and white translucency of a quill. There are two opaque bands round the apex. *Sculpture*. There are traces, exceedingly faint, of fine close-set striæ, which run elliptically round the shell on the lines of growth, and in some lights there is just a reflection as of some sort of remote longitudinal texture (very like that in *S. (Dischides) bifissum*, Wood). The *edge* of the mouth slopes backwards very obliquely from the concave to the convex side of the shell; it is thick, and all round it is smoothly rounded off. The *apex* projects on the convex side of the shell, and is split by four opposite, shallow, unequal, irregular, rough-edged, gaping clefts, so arranged as to leave the teeth at the convex and concave curves and at the two sides. The bands round the apex are two narrow callus-like ribs. L. 0.298. B. at mouth 0.03, at broadest 0.035, at apex 0.017.

This species approaches nearest to *Siphodontalium (Dischides) bifissum*, Wood, but that species has only two, and these lateral, narrow, deep, and regular, posterior clefts; its mouth is squarely cut off with a thin and jagged edge; its shell is very little contracted at the mouth, and contracts slowly but constantly all the way to the apex; is also longer, more bent, and thinner. *S. lofotense*, Sars, and *S. vitreum*, Sars, which have the four posterior clefts, are totally unlike in texture and in form.

5. SIPHODONTALIUM DICHELUM, *W.* (*διχηλος*.)

July 29, 1874. Levuka, Fiji. 12 fms. 1 specimen and 2 fragments.

Shell.—Long, slightly swollen at about three fifths of its length; the swelling bulges on the concave curve, but the convex curve is uninterrupted; between these two curves it is compressed by one sixth of its breadth, a little contracted in front, bent and attenuated toward the apex; thin, brilliant white, almost hyaline, with a few minute, transverse, curdy streaks, but weathering to opaque. There is an opaque band round the apex.

Sculpture. Most faint and delicate microscopic scratches on the lines of growth, with a minute transverse flocculence and some vague indication of longitudinal texture in the substance of the shell. The *mouth* is large, very oblique, with a smoothly rounded edge, which is sharp on the inner margin; both it and the posterior opening are oval. The *apex*, which is small, is split on either side by a deep, narrow, slightly widening, smooth, clean-cut, but not perfectly regular cleft, which is evidently carried up the shell as the growth of the animal demands, for it cuts across the transverse striæ, as Mr. Searles Wood remarks is the case with *S. (Dischides) bifissum*. Within the opening a short, minute, longitudinal, rib-like process projects along the middle of the posterior (*i. e.* convex curve) wall; a little further in a thin, narrow, circular callus runs round the opening. L. 0·35. B. at mouth 0·032, broadest 0·055, apex 0·022.

This is much larger than *S. tetraschistum*, W., and much less cylindrical, being much more contracted towards the mouth. The posterior internal rib is a curious feature. It shows *through* the shell like a crack or depression, but is a true internal rib.

6. SIPHODONTALIUM PRIONOTUM, W. (*πριονωτός, jagged.*)

St. 185. Aug. 31, 1874. Lat. 11° 35' S., long. 143° 3' E. Raine Island, C. York. 155 fms. Sand. 2 specimens and 2 fragments.

Shell.—Long, narrow, tapering, gently contracted at the mouth, slightly bent throughout; rather strong, polished, but hardly brilliant, translucent white. *Sculpture.* Very faintly transversely striated on the surface, and a very minute flocculence in the same direction in the texture. For the breadth of the shell the *mouth* is large, perfectly round, oblique, with a smoothly rounded edge, which is sharp on its inner margin. The *apex* is small, much chipped, but that in such a way as in all the specimens to produce a shallow rounded hollow on either side, with a sharp projecting point before and behind. Within the opening a short excessively minute riblet runs out along the middle of the posterior wall; it shines through the shell like a depression, being a little more transparent than the shell-wall. L. 0·328. B. at mouth 0·028, greatest 0·039, at apex 0·013.

This species differs from the previous in being much narrower

and having no swelling. From *S. tetraschistum*, W., it differs in being more elongated, more attenuated behind, and in the character of the posterior opening.

7. SIPHODONTALIUM EBORACENSE, *W.*

Sept. 7, 1874. Torres Strait, Cape York. 3-11 fms. 3 specimens.

Shell.—Small, narrow, tapering very gradually throughout; toward the apex bent, thin, brilliant, translucent and transparent in alternate bands. *Sculpture*. There are a few remote, irregular, oblique, transverse striæ; in the young shell the whole surface is covered with longitudinal striæ, excessively minute (0·0005 in. apart), sharp and regular, but which seem very easily rubbed off*, and which disappear towards the mouth. The *mouth* is round, very oblique, sharp, and thin. The *apex* is minute, and is broken straight across and somewhat chipped. L. 0·185. B. 0·024, at apex 0·008.

Than *S. prionotum*, W., this is smaller, straighter, but toward the apex more bent, not narrowed at the mouth; smaller at the apex, and the whole texture of the shell is different.

Than *S. vitreum*, S., this is less cylindrical, is not contracted toward the mouth, and is much smaller toward the apex.

CADULUS.

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|--------------------------------|---|
| 1. <i>C. colubridens</i> , W. | 7. <i>C. curtus</i> , W. |
| 2. <i>C. vulpidens</i> , W. | 7a. <i>C. curtus</i> , var. <i>congruens</i> , W. |
| 3. <i>C. rastridens</i> , W. | 8. <i>C. obesus</i> , W. |
| 4. <i>C. sauridens</i> , W. | 9. <i>C. tumidosus</i> , Jeffr. |
| 5. <i>C. gracilis</i> , Jeffr. | 10. <i>C. exiguus</i> , W. |
| 6. <i>C. simillimus</i> , W. | 11. <i>C. ampullaceus</i> , W. |

1. CADULUS COLUBRIDENS, *W.*

St. 169. July 10, 1874. Lat. 37° 34' S., long. 179° 22' E. N.E. point of New Zealand. 700 fms. Grey ooze. 1 specimen.

Shell.—Like an adder's fang; long, sharp, bent, very slightly flattened, swollen near the broader end. The swell, which is faintly angulated and is at one fourth of the length, is chiefly

* On two specimens it is barely traceable.

on the convex curve, but is visible on the concave curve too. From the angulation, the curve is very equable in either direction. About two thirds along toward the apex it bends more back. The shell is thin, brilliant, semiopaque, white. *Sculpture*. Very faint and fine scratches on the lines of growth. *Mouth* large, oval, very slightly flattened on the front side, from which the thin sharp edge is obliquely cut off towards the convex curve. The *posterior opening* is much smaller, nearly round, and the edge is thin and chipped. L. 0·58. B. at mouth 0·067, at swell 0·1, at apex 0·033.

This is twice the size of *C. gadus*, Montague; but it resembles that in the angulation, which, however, is here more marked at the summit of the swelling; its expansion from the smaller end is much more gradual, and its contraction from the angulation on to the mouth is more rapid.

2. CADULUS VULPIDENS, W.

St. 24. Mar. 25, 1873. Culebra Island, St. Thomas, D. W. Indies. 390 fms. Mud. 1 specimen.

Shell.—Like the canine tooth of a small Carnivore; long, sharp, bent, swollen (a little obliquely) nearer the broader end. The swelling is greatest on the convex curve, and lies there a little nearer the mouth (about one fourth of the length) than it does on the concave, where it is at about one third of the length. This obliquity makes the form a little unsymmetrical. From the swelling the shell contracts more rapidly towards the mouth. Toward the apex the bend increases, and the end of the shell is a very little contracted. The shell is pretty strong, brilliant, opaquish white. *Sculpture*. Very minute, but sharp, microscopic scratches on the lines of growth. *Mouth* small, round, obliquely truncated backward toward the convex curve. *Edge* thin and sharp. *Posterior opening* round; the edge thick, flat, slightly gnawed and broken, projecting a little on the convex curve side. L. 0·35. B. at mouth 0·039, at swelling 0·069, at apex 0·03.

This is smaller and less symmetrical than *C. colubridens*, and the mouth is much smaller. Than *Dentalium clavatum*, Gould, which it much resembles, this is more contracted in front and less so behind, and has more of angulation in its tumidity. Than *D. gadus*, Mont., this is a much less stumpy shell, being less swollen

in the middle, and more drawn out before and behind; it is also straighter. *Cadulus ventricosus*, Bronn, has the swelling nearer the mouth.

3. CADULUS RASTRIDENS, W.

St. 24. Mar. 25, 1873. Culebra Island, St. Thomas, Danish W. Indies. 390 fms. Mud. Many specimens.

Shell.—Like the tooth of a rake, small, narrow, bent, swollen, and on the convex curve very faintly angulated at about five eighths of its length, from which point both the bend and the narrowing of the shell is greater (proportionally) toward the mouth than it is toward the apex. Between the back and the belly there is a very slight compression of the shell. It is pretty strong, brilliant, more or less obscurely banded transversely, with alternate equal threads of opaque and transparent white. *Sculpture*. Very faint, superficial, transverse scratches. *Mouth* pretty large, not at all oblique, thin, sharp, and chipped; *posterior opening* round, straight; edge thickened, and less chipped than the mouth. L. 0.119. B. at mouth 0.015, at swelling 0.023, at apex 0.01.

4. CADULUS SAURIDENS, W.

St. 24. March 25, 1873. Culebra Island, St. Thomas, D. W. I. 390 fms. Mud. 1 specimen.

Shell.—Long, narrow, scarcely bent, swollen very slightly near the middle of the convex curve, just perceptibly and a little more anteriorly on the concave; both the bend and the contraction are greater towards the apex than towards the mouth. There is a very slight compression between the back and the belly of the shell. It is thin, brilliant, scarcely opaque, white. *Sculpture*. There is none, except perhaps some very faint microscopic traces of longitudinal texture. *Mouth* rather small, very oblique; edge thin, but not chipped. *Apical opening* small, straight across the shell, thin, chipped. L. 0.12. B. at mouth 0.01, at swelling 0.02, at apex 0.009.

This differs from *C. rastridens*, W., in being less bent, less swollen, the swelling more central, more apparent on the ventral curve; the shell is less attenuated posteriorly, and more so anteriorly; there is no transverse sculpture; the mouth here is oblique, the shell at the anal opening is not thickened, and both ends are narrower. Than *C. gracilis*, Jeffr., this is much smaller,

more attenuated, has a gibbous swelling, and not a mere equable enlargement, and has both openings much smaller.

From *C. Jeffreysi*, Monter., it differs still more strongly in these very respects, except that this is nearer it in size.

5. *CADULUS GRACILIS*, *Jeffr.*; *J. Gwyn Jeffreys, Ann. & Mag. Nat. Hist.* 1877, xix. p. 157.

St. 75. July 2, 1873. Lat. 38° 37' N., long. 28° 30' W. 450 fms. Sand. 1 specimen, young.

St. 78. July 10, 1873. Lat. 37° 24' N., long. 25° 13' W. Off San Miguel, Azores. 1000 fms. *Globigerina*-ooze. 2 specimens.

St. 85. July 19, 1873. Lat. 28° 42' N., long. 18° 6' W. Canaries. 1125 fms. Volcanic sand. 2 specimens, young.

Mr. Jeffreys got one specimen in the 'Valorous' at St. 13, 690 fms. He was good enough to verify my determination of this species. It is very like *C. Jeffreysi*, Monter.; but is larger and a little compressed (in the proportion of $\frac{1}{15}$) between the convex and concave curves as compared to its breadth, which is not the case in *C. Jeffreysi*. It is not so swollen, and the posterior opening is larger than in that species.

6. *CADULUS SIMILIMUS*, *W.*

St. 185. August 31, 1874. Lat. 11° 35' S., long. 144° 3' E. Raine Island, Cape York. 155 fms. Sand. 2 specimens.

St. 187. September 9, 1874. Lat. 10° 36' S., long. 141° 55' E. W. of Cape York. 6 fms. Coral sand. 2 specimens.

Shell.—Very like *C. gracilis*; rather broad, narrowed at both ends, very slightly and symmetrically bent, but a little more towards the mouth, with a very slight bulge, which just shows on the concave curve. It is thin, polished, translucent (weathering opaque), with an opaque ring near the apex. *Sculpture*. Very minute and faint superficial oblique striæ, with a faint flocculence in the substance of the shell. *Mouth* rather large, oblique; edge thin, but rounded. *Apical opening* small, thin, and chipped. L. 0·16. B. at mouth 0·02, greatest 0·036, at apex 0·014.

This differs from *C. gracilis*, *Jeffr.*, in being broader, with a slight bulge on the concave curve, in being a little more bent, and

in not being compressed. It is also smaller. It is extremely like *C. Jeffreysi*, Monter., but is a little more bent, especially in front, is larger, and seems a thinner shell.

7. *CADULUS CURTUS*, *W.*

St. 24. March 25, 1873. Culebra Island, St. Thomas, D. W. Indies. 390 fms. Mud. 30 specimens.

Shell.—Short, broad, narrowed at both ends, scarcely bent, and that almost wholly near the mouth; swollen in the middle, so as to bulge a little on the concave curve. Though the mouth is larger than the apex, the whole shell is a little more pinched in in front than behind, and is very slightly laterally compressed (in the proportion of about 14 to 15). It is thin, polished, translucent white, with one, sometimes two, opaque rings near the apex. *Sculpture*. Only under a high power of the microscope can some very close transverse striæ be seen in the texture of the shell. *Mouth* rather large, very slightly oblique; edge thin and generally much chipped. *Apical opening* small, straight, chipped. The opaque rings result from thickening, caused by a thin projection which narrows the opening. L. 0.1. B. at mouth 0.019, thickest 0.03, apex 0.012.

Than var. *congruens*, *W.*, this is not only very much smaller, but here the mouth is oblique, and the shell straighter behind and more bent in front, where, too, it is more pinched in. It is nearly of the same length as *C. obesus*, *W.*, but is very much narrower.

7a. *CADULUS CURTUS*, var. *CONGRUENS*, *W.*

St. 24. March 25, 1873. Culebra Island. St. Thomas, Danish W. Indies. 390 fms. Mud. 2 specimens.

This differs from *C. curtus*, *W.*, in being one third larger; the mouth is perhaps less oblique, but being in both specimens much chipped, this may be accidental. The most remarkable feature of difference is that it is perfectly round, and not, like the other, laterally compressed. I attribute this difference to age. At all events, in the absence of a larger series of specimens, I believe it safer to include both under one species.

8. *CADULUS OBESUS*, *W.*

St. 24. March 25, 1873. Culebra Island, St. Thomas, D. W. Indies. 390 fms. Mud. 10 specimens.

Shell.—Short, very broad, narrowed at both ends, little bent, and that almost entirely toward the mouth, very much swollen in the middle, and bulging a good deal on the concave curve, a little more attenuated behind, and very slightly laterally compressed (in the proportion of 14 to a little less than 15). It is pretty strong, polished, translucent white, with one, sometimes two opaque rings near the apex. *Sculpture*. A few very vague and faint, distant transverse lines. *Mouth* rather large, straight; edge thin and much chipped. *Apical opening* small, straight, chipped, narrowed inside by a minute shelf-like projecting ring. L. 0·109. B. at mouth 0·02, thickest 0·04, at apex 0·01.

This is nearly of the same proportions as *C. curtus*, except being very much broader; like that, too, it is narrowed laterally. I have hesitated very much in making it more than a variety; but, on the whole, think it safer to reckon it as distinct. One specimen has its breadth exaggerated by a gibbous pad of enamel.

9. *CADULUS TUMIDOSUS*, *Jeffr.*

St. 78. July 10, 1873. Lat. 37° 24' N., long. 25° 13' W. Azores. 1000 fms. *Globigerina*-ooze.

St. 85. July 19, 1873. Lat. 28° 42' N., long. 18° 6' W. Canaries. 1125 fms. Volcanic sand.

J. Gwyn Jeffreys, 'Valorous' dredgings, Ann. & Mag. N. H. 1877, xix. p. 156:—From St. 12, 1450 fms. In the 'Porcupine,' Channel slope, 557 fms.; Bay of Biscay, 292–1095 fms. 'Josephine' expedition, 110–550 fms. Fossil at Messina.

Mr. Gwyn Jeffreys verified my determination of this species.

I have failed to see the callus-rib in the mouth; but there is within the posterior opening a circular rib or narrow sharp ledge, which from the outside is seen as an opaque band, but with some difficulty may be seen within as a narrow projecting shelf. The edge of the apex seems to me rather chipped than regularly notched.

10. *CADULUS EXIGUUS*, *W.*

St. 24. March 25, 1873. Culebra Island, St. Thomas, D. W. I. 390 fms. Mud. 2 specimens.

Shell.—Very small, short, broad, pinched in, and projecting at both ends; very slightly bent, and that almost entirely in front; very much swollen in the middle, bulging on the concave curve,

a little more attenuated behind; pretty strong, polished, translucent and white, with an opaque white band round the apex. *Sculpture* none. *Mouth* large, straight; edge thin and chipped. *Apical opening* small, straight, chipped, narrowed inside by a minute shelf-like projecting ring. L. 0·076. B. at mouth 0·016, at broadest 0·035, at apex 0·01.

It differs from *C. ovulum*, Phil., in being very much smaller, rounder, and contracted into a tube at either end.

11. CADULUS AMPULLACEUS, W.

St. 24. March 25, 1873. Culebra Island, St. Thomas, D. W. Indies. 390 fms. Mud. 1 specimen.

Shell.—Small, round, but not symmetrical in its two curves, contracted in front, pinched in behind so as to form a short tube, swollen, the fullest bulge lying behind the middle. Pretty strong, polished and translucent white, with an opaque band close to the apex. *Sculpture* none. *Mouth* large, very slightly oblique; edge thin and chipped. *Apical opening* slightly oval, small, straight, roughened, narrowed inside by a flat, concentrically puckered, and margined ring, which occupies nearly half its diameter (0·014 and 0·006). The margin (about 0·001 thick) of this ring is formed by the projecting end of a short pipe (about 0·005 long) which passes up into the interior of the shell. L. 0·08. B. at mouth 0·02, at broadest 0·047, at apex 0·016.

This species is not only much smaller than *C. ovulum*, Ph., from the Mediterranean, but is obviously very different in form and proportions. It differs from *C. exiguus*, W., in being much rounder, has no tube anteriorly, is not nearly so elongated posteriorly, and is provided with a distinct posterior pipe.